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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/320,271	05/27/1999	HIROYUKI WATANABE	990559	4409

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EXAMINER

LEE, CALVIN

ART UNIT PAPER NUMBER

2825

DATE MAILED: 08/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.  
**09/320,271**

Applicant(s)  
**H. WATANABE et al.**

Examiner  
**Calvin Lee**

Art Unit  
**2825**



**-- Th MAILING DATE of this communication app ars on the cover sheet with th correspondence address --**

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on July 9, 2002 (Amendment D)

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) 1-13 and 21 is/are pending in the applica

4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from considera

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-13 and 21 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirem

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☒ All b) ☐ Some\* c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

5) ☐ Notice of Informal Patent Application (PTO-152)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 22

6) ☐ Other:

**FINAL ACTION**

***Response to Pre Amendment***

1. The IDS filed on 5/24/02 and the amendment of claim 1 in Paper 23, dated July 9, 2002, are acknowledged.

***Claim Rejections - 35 USC § 102***

2. Claims 1-13 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by *Mizuhara et al.* or *Watanabe et al.*

a) *Mizuhara* discloses a semiconductor device and its method, comprising the steps of:

- forming an organic SOG layer **9** (as a first insulator) on an oxide film **8** and over a flat substrate's face [Figs. 4-5 and col. 4, lines 25-43]
- introducing impurities B<sup>+</sup> into the organic SOG layer (so the impurities arrive at the interface between the SOG layer and its underlying oxide), thereby modifying the organic SOG layer **9** to an SOG layer **10** [Fig. 6 and col. 4, lines 45-51]
- forming a via hole **12** in the modified SOG layer using a mask pattern [col. 4, lines 58-62]
- embedding and forming a first conductive layer **13** of copper alloy in the trench [col. 5]

The method can extend to have second, third, and fourth interconnections, as desired, by repeating the above steps [col. 5 line 61 through col. 6 line 62].

b) *Watanabe* teaches a fabrication method of a semiconductor device, comprising the steps:

- forming an organic SOG layer **8** (containing 1% of carbon) on an oxide film **5** overlying a substrate **1** [col. 6 lines 1-18]

- introducing impurities into the insulating layer [Fig. 4] so the impurities arrive at the interface between the insulating layer and the oxide film [col. 6, line 39 and col. 7, line 32]

Note: the implantation at the interface between organic SOG layer 8 and oxide film 5 prevents modified SOG layer 9 [col. 6, line 53] from being easily peeled off from the oxide film [col. 6, lines 52-59 and col. 7, lines 30-37]

- forming a via hole 10 in the insulation layer [col. 8 lines 52-63]

- embedding and forming a first conductive layer 11 over the trench [Fig. 5 and col. 7 lines 9-29]

The method can be repeated to form a conventional multi layer structure having second, third, and fourth interconnections, as required.

Although neither *Mizuhara et al.* nor *Watanabe et al.* teaches or suggests a trench, their via holes are equivalent to a claimed trench for subsequent interconnect formation. As a result, both *Mizuhara et al.* and *Watanabe et al.* inherently teaches a trench formed in an insulating layer

### ***Response to Arguments***

3. The rejection under 35 USC 112 in the last Office Action is moot since the fourth-time amended claim 1 no longer refers to a trench.

Applicant's argument, that *Mizuhara* or *Watanabe* fails to teach that the first insulating layer is formed on a flat underlying face over a substrate, is unpersuasive. First of all, the specification supports no such feature. Secondly Examiner notes that *Watanabe* suggests forming an SOG by a conventional method [col. 6]: "the alcohol based solution coating is formed thick at the concave portion and thin at the convex portion with respect to the step-graded portion on single crystal silicon substrate 1 to alleviated the unevenness", wherein a new-formed SOG film

has a flat surface regardless of its underlying film/feature. Moreover, Examiner notes that Applicant suggests also the same method of forming SOG film 3 on page 8, lines 3-11.

Hence, Applicants' argument is moot in light of a final rejection.

4. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire three months from the mailing date of this action. In the event a first reply is filed within two months of the mailing date of this final action and the advisory action is not mailed until after the end of the three-month shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than six months from the date of this final action.

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (703) 306-5854 from 7 to 17 ET (Monday through Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* whose telephone number is (703) 308-1323.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

CL

August 19, 2002

  
CAROL KUEHNER  
PRIMARY EXAMINER